

201-14141

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Lisa Medley/DC/USEPA/US

01/03/2006 11:15 AM

To NCIC HPV@EPA

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bcc

Subject Fw: HPV test plan and robust summaries - dimethyl disulfide

2006 JAN 13 AM 11:40

Lisa Medley

OPPT/OSWER Docket - EPA HQ Docket Center

(Operated by ASRC Management Services)

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--- Forwarded by Lisa Medley/DC/USEPA/US on 01/03/2006 11:15 AM ---



Ann TVEIT

<ann.tveit@arkemagroup.com>

12/31/2005 12:15 PM

To NCIC OPPT@EPA, Rtk Chem@EPA

cc Sandi MURPHY <sandi.murphy@arkemagroup.com>

Subject HPV test plan and robust summaries - dimethyl disulfide

Attached please find the test plan and currently available robust study summaries for dimethyl disulfide, (CAS# 624-92-0) which Arkema Inc volunteered to sponsor in the HPV program in a letter dated October 21, 2005. The test plan and robust study summaries will be updated as additional information becomes available.

If you have any questions please feel free to contact me. My contact information is listed below.

Thanks

Ann

Ann Tveit, Ph.D., DABT

Arkema Inc

2000 Market St.

Philadelphia, PA 19103

phone 215-419-5604

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email ann.tveit@arkemagroup.com dmds-hpv.pdf test plan dmds.pdf

201-16161A

High Production Volume (HPV) Challenge Program

DIMETHYL DISULFIDE
(CAS# 624-92-0)
Test Plan

2006 JAN 13 AM 11:40

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Arkema Inc.
2000 Market Street
19103 Philadelphia, PA

December 2005

EXECUTIVE SUMMARY

Arkema Inc has volunteered to sponsor dimethyl disulfide (DMDS, CAS# 624-92-0) in the USEPA HPV program. The DMDS Test Plan is being submitted to fulfill the United States Environmental Protection Agency (USEPA) High Production Volume (HPV) Challenge Program commitment for DMDS.

Data from company proprietary files, peer-reviewed literature, and/or calculated endpoints using widely accepted computer modeling programs have been identified for purposes of this program. Robust summaries of the available data are included in the attached IUCLID. The following table summarizes the available data and proposed testing for DMDS.

Table 1: Matrix of Available and Adequate Data on DMDS

“SIDS ENDPOINT”	Data Available Y/N	Testing Planned? Y/N
Physical and Chemical Data		
Melting Point	Y	N
Boiling Point	Y	N
Vapor Pressure	Y	N
Partition Coefficient	Y	N
Water Solubility	Y	N
Environmental Fate		
Photodegradation	Y	N
Stability in Water (Hydrolysis)	N	Y
Transport/Distribution	Y	N
Biodegradation	Y	N
Ecotoxicity		
Acute/Prolonged Toxicity to Fish	N	Y
Acute Toxicity to Aquatic Invertebrates (<i>Daphnia</i>)	Y	N
Acute Toxicity to Aquatic Plants (Algae)	Y	N
Toxicity		
Acute Toxicity (Oral)	Y	N
Acute Toxicity (Dermal)	Y	N
Acute Toxicity (Inhalation)	Y	N
Repeated Dose	Y	N
Genetic Toxicity <i>in vitro</i> – Gene Mutation	Y	N
Genetic Toxicity <i>in vitro</i> – Chromosomal Aberration	Y	N
Reproductive Toxicity	Y	N
Developmental Toxicity	Y	N

Note: The data used to characterize the OECD SIDS endpoints for substances in this Test Plan were identified either in company proprietary files, peer-reviewed literature, and/or calculated using widely accepted computer modelling programs. All data were evaluated for study reliability in accordance with criteria outlined by the USEPA (1999a). Only studies that met the reliability criteria of “1” (reliable without restrictions) or “2” (reliable with restrictions) were used. Additional data are also included in the IUCLID (International Uniform Chemical Information Dataset) attached in Annex I. A more detailed discussion of the data quality and reliability assessment process used to develop this test plan is provided in Annex II.

1.1 Physico-Chemical properties

DMDS is a pale yellow liquid with a strong garlic like odor. Experimental data for the physical chemical parameters are available and reported in EPIWIN[®] (USEPA, 2004) and are provided in the following table.

Table 2. Physicochemical Data

<i>Parameter</i>	<i>Value</i>
Melting Point	-85°C ¹
Boiling Point	110°C ¹
Vapor Pressure	29.3 hPa
Kow Partition Coefficient	1.77 ¹
Water Solubility (mg/l)	2500 ¹

¹EPIWIN v3.12 – Syspro database

Conclusion

Adequate data are available for the HPV physical/chemical property endpoints. No additional testing for the HPV program is proposed.

GENERAL INFORMATION ON EXPOSURE

1.2 Production Volumes and Use Pattern

DMDS is on EPA's high production volume list indicating it is manufactured and/or imported at greater than 1 million pounds per year according to the toxic inventory update rule (IUR).

1.2.1 Use Pattern:

DMDS has several industrial uses. It is used in the oil industry as a sulfiding/presulfiding agent to activate catalysts of hydrotreating units, to reduce the number of decoking operations in the petrochemical industry, as a chemical intermediate in the fine chemical industry, and as an anti-corrosive in metallurgy.

1.3 Environmental Exposure and Fate

1.3.1 Photodegradation

The photodegradation of DMDS was evaluated using EPIWIN 3.12. The half life of DMDS was calculated to be 0.565 hours based on the experimental rate constant of 227×10^{-12} cm³/molecule-sec.

Conclusion

Adequate data are available to assess the photodegradation of DMDS. No additional studies are proposed for the HPV program.

1.3.2 Stability in Water

EPIWIN was unable to calculate a hydrolysis rate for DMDS. A hydrolysis study is proposed for DMDS.

1.3.3 Transport between Environmental Compartments

The transport of DMDS between environmental compartments was assessed by fugacity modeling using EPIWIN (v3.12). Results are listed in the table below:

Table 3. Fugacity Results for DMDS

Compartment	Mass amount (%)	Estimated half life (hr)
Air	1.01	1.13
Water	58.1	360
Soil	40.8	360
Sediment	0.168	3.24x e003

1.3.4 Biodegradation

DMDS was not readily biodegradable when evaluated according to OECD 301D. The degradation was less than 10% following 28 days exposure.

Conclusion

Adequate data are available to assess the biodegradation of DMDS. No additional studies are proposed for the HPV program.

2 HUMAN HEALTH HAZARDS

2.1.1 Acute Toxicity

Single exposure (acute) studies indicate DMDS is moderately toxic if swallowed (rat; 290 mg/kg < LD50 < 500 mg/kg), no more than slightly toxic if absorbed through skin (rabbit LD50 >2,000 mg/kg), and slightly toxic if inhaled (rat 4-hr LC50 805 ppm).

Conclusion

Adequate data are available to assess the acute toxicity of DMDS and no additional studies are proposed.

2.1.2 Repeated Dose Toxicity

DMDS was evaluated in a 90-day repeated dose study on rats according to OECD guidelines. This study featured inhalation dosing, measurement of mortality, body weight changes, food consumption, hematological and blood biochemical examinations, urinalysis, organ weights, histopathology and a functional observational battery. Rats were exposed whole body to 0, 10, 50, 150, and 250 ppm DMDS for 6 hours per day for 90 days. Satellite groups were evaluated

following a 2-week recovery period. Results from this study showed decreased body weights, food consumption, hypoactivity, changes in white blood cell counts, reduced thymus gland weight and increased liver weight. Reversible microscopic changes were noted in the nasal mucosa.

Conclusion

Adequate data are available to assess the reproductive toxicity of DMDS. No additional testing is proposed for purposes of the HPV program.

2.1.3 Mutagenicity

Several reliable genetic toxicity studies are available for DMDS. Predominantly negative results were obtained with DMDS when tested *in vitro* (negative bacterial and mammalian mutagenicity assays, negative DNA damage and repair, ambiguous positive *in vitro* chromosome aberration study using human lymphocytes). Negative results were obtained when DMDS was evaluated *in vivo* (mouse micronucleus, unscheduled DNA synthesis).

Conclusion

Adequate data are available to assess the genetic toxicity of DMDS. No additional testing is proposed for purposes of the HPV program.

2.1.4 Toxicity for Reproductive/Developmental Toxicity

Reproductive Toxicity

The 90 day repeated dose toxicity study will be used to assess the reproductive toxicity of DMDS. Reproductive organs examined in this study included the epididymus, prostate, and testes in males and ovaries and uterus in females. No lesions were reported.

Developmental Toxicity

A Developmental Toxicity test was completed for DMDS in Sprague-Dawley rats following OECD Guideline 414 "Teratogenicity." DMDS was administered by inhalation to 0, 5, 15, and 50 ppm on gestation days 6 to 15. Maternal toxicity was noted at 15 and 50 ppm. No evidence of developmental toxicity was observed. No additional studies are proposed.

Conclusion

Adequate data are available to assess the reproductive and developmental toxicity of DMDS. No additional testing is proposed for the HPB program.

3 HAZARDS TO AQUATIC ORGANISMS

DMDS has been evaluated in an acute daphnia immobilization and algal growth inhibition studies. DMDS is moderately toxic to daphnia with a 48 hour EC50 value of 7 mg/l. DMDS is slightly toxic to *Selenastrum capricornutum* alga with a 72 hour EC50 of 35 mg/l. No data are available for acute fish and alga. No data are available to assess the acute fish toxicity and an acute fish toxicity (OECD guideline 203) is proposed for DMDS.

Conclusion

Adequate data are available to assess the aquatic toxicity of DMDS to daphnia and alga but not fish. An acute fish toxicity study is proposed (OECD guideline 203) for DMDS.

References

Atofina, 2005. IUCLID Data Set, CAS No. 624-92-0 dimethyldisulfide. Atofina, Paris, France.

Klimisch, H.J., E. Andreae, and U. Tillmann. 1997. A systematic approach for evaluating the quality of experimental and ecotoxicological data. *Reg. Tox. and Pharm.* 25: 1-5.

Organisation for Economic Co-operation and Development (OECD) Secretariat. 2002. *Manual for Investigation of HPV Chemicals* (November 2002).

U.S. Environmental Protection Agency (USEPA), Office of Pollution Prevention and Toxics. 1998. Guidance for Meeting the SIDS Requirements: Chemical Right-to-Know Initiative.

USEPA, Office of Pollution Prevention and Toxics. 1999b. Draft Determining the Adequacy of Existing Data.

USEPA, Office of Pollution Prevention and Toxics and Syracuse Research Corporation. 2004. EPI Suite v 3.12.

ANNEX I: DIMETHYL DISULFIDE IUCLID

See attached IUCLID documents.

ANNEX II: DATA QUALITY ASSESSMENT

Available environmental, ecotoxicity, and mammalian toxicity studies were reviewed and assessed for reliability according to standards specified by Klimisch et al., (1997), as recommended by the USEPA (1999a) and the OECD (OECD, 2002). The following reliability classification (Klimisch rating) has been applied to each study assessed:

- *1 = Reliable without Restriction* – Includes studies that comply with USEPA- and/or OECD-accepted testing guidelines and were conducted using Good Laboratory Practices (GLPs) and for which test parameters are complete and well documented;
- *2 = Reliable with Restriction* – Includes studies that were conducted according to national/international testing guidance and are well documented. May include studies that were conducted prior to establishment of testing standards or GLPs but meet the test parameters and data documentation of subsequent guidance; also includes studies with test parameters that are well documented and scientifically valid but vary slightly from current testing guidance. Also included in this category were physical-chemical property data obtained from reference handbooks, as well as environmental endpoint values obtained from an accepted method of estimation (e.g., USEPA's EPIWIN estimation program);
- *3 = Not Reliable* – Includes studies in which there are interferences in either the study design or results that provide scientific uncertainty or in which documentation is insufficient; and,
- *4 = Not Assignable* – This designation is used in this dossier for studies that appear scientifically valid but for which insufficient information is available to adequately judge robustness.

Those studies receiving a Klimisch rating of 1 or 2 are considered adequate to support data assessment needs in this dossier. Those key studies selected for inclusion are considered typical of the endpoint responses observed in other studies of a similar nature and design that were identified during our search of the literature.

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I U C L I D

Data Set

Existing Chemical	: ID: 624-92-0
CAS No.	: 624-92-0
EINECS Name	: dimethyl disulphide
EC No.	: 210-871-0
TSCA Name	: Disulfide, dimethyl
Molecular Formula	: C ₂ H ₆ S ₂

Producer related part	
Company	: ATOFINA Chemicals Inc.
Creation date	: 27.12.2005

Substance related part	
Company	: ATOFINA Chemicals Inc.
Creation date	: 27.12.2005

Status	:
Memo	:

Printing date	: 31.12.2005
Revision date	:
Date of last update	: 31.12.2005

Number of pages	: 51
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Chapter (profile)	: Chapter: 1, 2, 3, 4, 5, 6, 7, 8, 10
Reliability (profile)	: Reliability: without reliability, 1, 2, 3, 4
Flags (profile)	: Flags: without flag, confidential, non confidential, WGK (DE), TA-Luft (DE), Material Safety Dataset, Risk Assessment, Directive 67/548/EEC, SIDS

1. General Information

Id 624-92-0
Date 31.12.2005

1.0.1 APPLICANT AND COMPANY INFORMATION

Type : manufacturer
Name : ARKEMA
Contact person :
Date :
Street : 4-8, cours Michelet La Défense 10
Town : 95091 Paris La Défense Cedex
Country : France
Phone : +33 1 49 00 80 80
Telefax :
Telex :
Cedex :
Email :
Homepage :

Source : Atofina Paris La Défense Cedex
14.12.2005

Type : importer of product
Name : ARKEMA Chemicals Inc.
Contact person :
Date :
Street : 2000 Market Street
Town : Philadelphia
Country : United States
Phone :
Telefax :
Telex :
Cedex :
Email :
Homepage :

Remark : formerly ATOFINA Inc.
Source : Atofina Paris La Défense Cedex
31.12.2005

1.0.2 LOCATION OF PRODUCTION SITE, IMPORTER OR FORMULATOR

1.0.3 IDENTITY OF RECIPIENTS

1.0.4 DETAILS ON CATEGORY/TEMPLATE

1.1.0 SUBSTANCE IDENTIFICATION

IUPAC Name :
Smiles Code :
Molecular formula : C2-H6-S2
Molecular weight : 94.2
Petrol class :

Source : Atofina Paris La Défense Cedex
23.12.2005

1. General Information

Id 624-92-0
Date 31.12.2005

1.1.1 GENERAL SUBSTANCE INFORMATION

Purity type : typical for marketed substance
Substance type : organic
Physical status : liquid
Purity : > 99.5 % w/w
Colour : Light yellow
Odour : Strong garlic odour

Source : ARKEMA, Paris-la-Défense, France (JFR)
Atofina Paris La Défense Cedex
23.12.2005

1.1.2 SPECTRA

1.2 SYNONYMS AND TRADE NAMES

DMDS
2,3-Dithiabutane
Dimethyl disulfide
Dimethyldisulfide
Disulfide, dimethyl
Methyldisulfide
Methyldithiomethane

Source : ARKEMA, Paris-la-Défense, France
Atofina Paris La Défense Cedex
27.12.2005

1.3 IMPURITIES

1.4 ADDITIVES

1.5 TOTAL QUANTITY

1.6.1 LABELLING

1.6.2 CLASSIFICATION

1.6.3 PACKAGING

1.7 USE PATTERN

Type of use : industrial
Category : Chemical industry: used in synthesis

1. General Information

Id 624-92-0
Date 31.12.2005

Source : Atofina Paris La Défense Cedex
23.12.2005

Type of use : industrial
Category : other: Sulphurization agent (Petrochemical)

Source : ARKEMA, Paris-la-Défense, France (JFR)
Atofina Paris La Défense Cedex
23.12.2005

1.7.1 DETAILED USE PATTERN

1.7.2 METHODS OF MANUFACTURE

1.8 REGULATORY MEASURES

1.8.1 OCCUPATIONAL EXPOSURE LIMIT VALUES

1.8.2 ACCEPTABLE RESIDUES LEVELS

1.8.3 WATER POLLUTION

1.8.4 MAJOR ACCIDENT HAZARDS

1.8.5 AIR POLLUTION

1.8.6 LISTINGS E.G. CHEMICAL INVENTORIES

Type : EINECS
Additional information : 210-871-0

Source : Atofina Paris La Défense Cedex
23.12.2005

1.9.1 DEGRADATION/TRANSFORMATION PRODUCTS

1.9.2 COMPONENTS

1.10 SOURCE OF EXPOSURE

1. General Information

Id 624-92-0
Date 31.12.2005

1.11 ADDITIONAL REMARKS

1.12 LAST LITERATURE SEARCH

Type of search : Internal and External
Chapters covered : 3, 4, 5
Date of search : 23.12.2005

Source : ARKEMA, Paris-la-Défense, France (JFR)
Atofina Paris La Défense Cedex
23.12.2005

1.13 REVIEWS

2.1 MELTING POINT

Value	: -85 °C	
Reliability	: (2) valid with restrictions	
Flag	: Critical study for SIDS endpoint	
27.12.2005		(18)
Value	: = -84.7 °C	
Sublimation	:	
Method	:	
Year	:	
GLP	: no data	
Test substance	:	
Source	: Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex	
15.11.1993		(28)

2.2 BOILING POINT

Value	: = 109.6 °C at 1013 hPa	
Decomposition	: yes	
Method	:	
Year	:	
GLP	: no data	
Test substance	:	
Remark	: Start of Decomposition: 390 degree C Decomposition products: Hydrogen sulphide, Dimethyl sulphide and methanethiol Similar result (109.6C) reported in Epiwin 312 syspro experimental database	
Source	: Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex	
Reliability	: (2) valid with restrictions	
Flag	: Critical study for SIDS endpoint	
31.12.2005		(28)

2.3 DENSITY

Type	: density	
Value	: = 1.063 g/cm ³ at 20 °C	
Method	:	
Year	:	
GLP	: no data	
Test substance	:	
Source	: Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex	
15.11.1993		(28)

2.3.1 GRANULOMETRY

2.4 VAPOUR PRESSURE

Value : = 29.3 hPa at 20 °C
Decomposition :
Method :
Year :
GLP : no data
Test substance :

Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex

Reliability : (2) valid with restrictions
Flag : Critical study for SIDS endpoint
27.12.2005

(32)

Value : = 38 hPa at 25 °C
Decomposition :
Method :
Year :
GLP : no data
Test substance :

Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex

15.11.1993

(28)

2.5 PARTITION COEFFICIENT

Partition coefficient : octanol-water
Log pow : = 1.77 at °C
pH value :
Method : other (measured)
Year :
GLP :
Test substance : no data

Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex

Reliability : (2) valid with restrictions
Flag : Critical study for SIDS endpoint
31.12.2005

(20)

Partition coefficient : octanol-water
Log pow : = 1.87 at °C
pH value :
Method : other (calculated)
Year :
GLP :
Test substance :

Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex

04.12.2001

(31)

2.6.1 SOLUBILITY IN DIFFERENT MEDIA

Solubility in : Water

2. Physico-Chemical Data

Id 624-92-0

Date 31.12.2005

Value : = 2500 mg/l at 20 °C
pH value :
concentration : at °C
Temperature effects :
Examine different pol. :
pKa : at 25 °C
Description :
Stable :
Deg. product :
Method :
Year :
GLP : no data
Test substance :

Remark : Unit of water solubility: ppm
Similar data (3000 mg/l) reported in EPIWIN v3.12 experimental database
Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex
Reliability : (2) valid with restrictions
Flag : Critical study for SIDS endpoint
31.12.2005 (32)

2.6.2 SURFACE TENSION

2.7 FLASH POINT

Value : = 16 °C
Type : closed cup
Method : other
Year :
GLP : no data
Test substance :

Remark : Method: ASTM D 93
Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex
15.11.1993 (28)

2.8 AUTO FLAMMABILITY

2.9 FLAMMABILITY

Result : flammable
Method :
Year :
GLP : no data
Test substance :

Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex
15.11.1993 (28)

2.10 EXPLOSIVE PROPERTIES

2. Physico-Chemical Data

Id 624-92-0

Date 31.12.2005

Result : other
Method :
Year :
GLP : no data
Test substance :

Remark : Explosive limits of vapours: 1.1 to 16.1 %v/v in air
Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex

15.11.1993

(28)

2.11 OXIDIZING PROPERTIES

2.12 DISSOCIATION CONSTANT

2.13 VISCOSITY

2.14 ADDITIONAL REMARKS

3. Environmental Fate and Pathways

Id 624-92-0

Date 31.12.2005

3.1.1 PHOTODEGRADATION

Type : air
Light source :
Light spectrum : nm
Relative intensity : based on intensity of sunlight

INDIRECT PHOTOLYSIS

Sensitizer : OH
Conc. of sensitizer :
Rate constant : = .000000000227 cm³/(molecule*sec)
Degradation : = 50 % after .6 hour(s)

Result : AOP Program (v1.91) Results:
=====

SMILES : S(SC)C
CHEM : Disulfide, dimethyl
MOL FOR: C2 H6 S2
MOL WT : 94.19

----- SUMMARY (AOP v1.91): HYDROXYL RADICALS -----

Hydrogen Abstraction = 2.1216 E-12 cm³/molecule-sec
Reaction with N, S and -OH = 225.0000 E-12 cm³/molecule-sec
Addition to Triple Bonds = 0.0000 E-12 cm³/molecule-sec
Addition to Olefinic Bonds = 0.0000 E-12 cm³/molecule-sec
Addition to Aromatic Rings = 0.0000 E-12 cm³/molecule-sec
Addition to Fused Rings = 0.0000 E-12 cm³/molecule-sec

OVERALL OH Rate Constant = 227.1216 E-12 cm³/molecule-sec
HALF-LIFE = 0.047 Days (12-hr day; 1.5E6 OH/cm³)
HALF-LIFE = 0.565 Hrs

----- SUMMARY (AOP v1.91): OZONE REACTION -----

***** NO OZONE REACTION ESTIMATION *****
(ONLY Olefins and Acetylenes are Estimated)

Experimental Database Structure Match:
Chem Name : Dimethyl disulfide
CAS Number: 000624-92-0
Exper OH rate constant : 227 E-12 cm³/molecule-sec
Exper OH Reference: KWOK,ESC & ATKINSON,R (1994)
Exper Ozone rate constant: --- cm³/molecule-sec
Exper NO₃ rate constant : 7 E-13 cm³/molecule-sec

Reliability : (2) valid with restrictions
Acceptable calculation method based on experimental rate constant.

Flag : Critical study for SIDS endpoint
31.12.2005

3.1.2 STABILITY IN WATER

Type : abiotic
t1/2 pH4 : at °C
t1/2 pH7 : at °C
t1/2 pH9 : at °C

Remark : Hydrolysis at ambient temperature and pH<12 is too slow to be an important environmental fate process.

3. Environmental Fate and Pathways

Id 624-92-0

Date 31.12.2005

Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex
Reliability : (2) valid with restrictions
Flag : Critical study for SIDS endpoint
27.12.2005

(7)

3.1.3 STABILITY IN SOIL

3.2.1 MONITORING DATA

3.2.2 FIELD STUDIES

3.3.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS

Type : fugacity model level III
Media :
Air : 1.01 % (Fugacity Model Level I)
Water : 58.1 % (Fugacity Model Level I)
Soil : 40.8 % (Fugacity Model Level I)
Biota : % (Fugacity Model Level II/III)
Soil : .165 % (Fugacity Model Level II/III)
Method : other: model
Year :
Result : Level III Fugacity Model (Full-Output):
=====

	Mass Amount (percent)	HalfLife (hr)	Emissions (kg/hr)
Air	1.01	1.13	1000
Water	58.1	360	1000
Soil	40.8	720	1000
Sediment	0.165	3.24e+003	0

	Fugacity (atm)	Reaction (kg/hr)	Advection (kg/hr)	Reaction (percent)	Advection (percent)
Air	9.37e-012	2.21e+003	36.1	73.8	1.2
Water	1.34e-008	400	208	13.3	6.93
Soil	1.17e-007	141	0	4.69	0
Sediment	1.2e-008	0.126	0.0118	0.00421	0.000394

Persistence Time: 119 hr
Reaction Time: 130 hr
Advection Time: 1.47e+003 hr
Percent Reacted: 91.9
Percent Advected: 8.14

Half-Lives (hr), (based upon Biowin (Ultimate) and Aopwin):
Air: 1.131

3. Environmental Fate and Pathways

Id 624-92-0
Date 31.12.2005

Water: 360
Soil: 720
Sediment: 3240
Biowin estimate: 2.991 (weeks)

Advection Times (hr):

Air: 100
Water: 1000
Sediment: 5e+004

Reliability : (2) valid with restrictions
Flag : Critical study for SIDS endpoint
31.12.2005

(19)

3.3.2 DISTRIBUTION

3.4 MODE OF DEGRADATION IN ACTUAL USE

3.5 BIODEGRADATION

Type : aerobic
Inoculum :
Contact time :
Degradation : < 10 (±) % after 28 day(s)
Result : other: not readily biodegradable
Kinetic of testsubst. : 7 day(s) = .3 %
14 day(s) = 1.1 %
20 day(s) = 1.9 %
28 day(s) < 0 %
%
Control substance : Benzoic acid, sodium salt
Kinetic : 14 day(s) = 86.1 %
28 day(s) = 84.5 %
Deg. product : not measured
Method : OECD Guide-line 301 D "Ready Biodegradability: Closed Bottle Test"
Year : 1992
GLP : no
Test substance : as prescribed by 1.1 - 1.4
Result : O2 dissolved (mg/l)

	0 d	7 d	14 d	20 d	28 d
1- Medium + inoculum					
mean		8.41	8.26	8.12	7.64 7.32
2- Medium + inoculum + test substance					
mean		8.42	8.24	8.05	7.51 7.44
3- Medium + inoculum + test substance + reference substance					
mean		8.37	5.55	5.43	4.79 4.74
4- Medium + inoculum + reference substance					
mean		8.41	2.61	2.37	2.09 1.68

BOD (O2 mg/mg substance)

3. Environmental Fate and Pathways

Id 624-92-0
Date 31.12.2005

	0 d	7 d	14 d	20 d	28 d
serie 2 (substance)	0.00	0.01	0.02	0.04	-0.04
serie 3 (inhibition control)	0.00	0.76	0.76	0.80	0.73
serie 4 (reference)	0.00	1.41	1.44	1.39	1.41

BIODEGRADATION (%)

	0 d	7 d	14 d	20 d	28 d
serie 2 (substance)	0	0.3	1.1	1.9	-1.8
serie 3 (inhibition control)	0	40.1	39.9	42.2	38.2
serie 4 (reference)	0	84.5	86.1	83.1	84.5

Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex

Reliability : (2) valid with restrictions
Guideline study without detailed documentation.

Flag : Critical study for SIDS endpoint

31.12.2005

(8)

3.6 BOD5, COD OR BOD5/COD RATIO

3.7 BIOACCUMULATION

3.8 ADDITIONAL REMARKS

4.1 ACUTE/PROLONGED TOXICITY TO FISH

4.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES

Type : static
Species : Daphnia magna (Crustacea)
Exposure period : 48 hour(s)
Unit : mg/l
EC50 : = 7
EC50, 24 h : > 13.4
Analytical monitoring : yes
Method : OECD Guide-line 202
Year : 1996
GLP : yes
Test substance : other TS: DMDS, Atofina, 98.93% purity

Result : - Biological observations
 20 daphnia per concentration

mg/l	%Immo					
nominal		1	2	3	4	total
13.4	85	1	1	0	1	3
10.6	75	1	2	1	1	5
9.5	70	2	2	1	1	6
7.8	60	3	2	2	1	8
6.3	50	3	2	3	2	10
5.5	45	3	3	3	2	11
4.7	20	4	4	4	4	16
3.8	10	4	5	4	5	18
3.3	10	5	5	4	4	18
0 témoin	10	5	4	5	4	18

Source : - EC50, 48h : 7 mg/l ; 95% CI : 6.5 - 7.6 mg/l
 : Atofina, Paris-la-Défense, France.
 Atofina Paris La Défense Cedex

Test condition : - Test organisms
 Daphnia magna Straus Clone A from INERIS, France. Breeding colony realized in the laboratory in an Elendt M7 medium, supplemented with algal based feed. Organisms are selected by sieving.
 Age at study initiation : < 24h old, laboratory bred

- A stock solution is prepared before the beginning of the test, by mixing 100 mg of the substance with 1 liter of dilution water.
 Test temperature range : 20-21°C
 Exposure vessel type :
 Closed flasks (120 ml) as test glassware entirely filled with test solutions and stoppered with PTFE bungs and sealed with aluminum caps.

-Dilution water is prepared in the laboratory using pure water and salts according to ISO 6341.
 25 ml/l of the below solutions , aerated up to oxygen

saturated

11.76 g CaCl₂, 2 H₂O /l ultrapure water
4.93 g MgSO₄, 7 H₂O /l ultrapure water
2.59 g NaHCO₃ /l ultrapure water
0.23 g KCl /l ultrapure water

- Dilution water chemistry

According to ISO 6341

Ca+Mg ions = 2.5 mmol/l.

Ca/Mg = 4

Na/K = 10

pH 7.8 ± 0.2

- incubation of test flasks in darkness.

- Water chemistry in test :

C nominal

(mg/l) 0 3.3 4.0 4.8 5.8 6.9 8.3 10.0 12.0 14.4

O₂ at 48h (mg/l)

8.3 8.2 8.2 8.3 8.3 8.3 8.3 8.4 8.3 8.3

pH at 48 h

7.89 7.90 7.88 7.88 7.95 7.93 7.96 8.01 8.03 8.00

- Test design

Nominal	Concentration		
	Initial mg/l	Measured Final mg/l	Final/Initial %
3.3	3.3	3.6	109.1
4.0	3.8	4.1	107.9
4.8	4.7	5.2	110.6
5.8	5.5	5.3	96.4
6.9	6.3	6.6	104.8
8.3	7.8	8.2	105.1
10	9.5	9.9	104.2
12	10.6	11.8	111.3
14.4	13.4	13.7	102.2

- Analytical monitoring Gas chromatography/FID

- 5 individuals per replicate

Reliability

Flag

27.12.2005

: (1) valid without restriction
: Critical study for SIDS endpoint

(10)

Type

Species

Exposure period

Unit

EC50

Analytical monitoring

Method

Year

GLP

Test substance

: static
: Daphnia pulex (Crustacea)
: 4 hour(s)
: mg/l
: = 21.4
: no
: other
: 1963
: no
: no data

Method

: Groups of 3-5 daphnia were dispensed into glass sample vials, each of which containing 5.0 ml of a biological harmless "culture water" at 21°C.

4. Ecotoxicity

Id 624-92-0

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	15.0 ml of toxic solution were added. The vials were transported in the darkness of a covered , thermostatically controlled water-bath (21+-0.05°C). The vials were set up in triplicate. There were 6 concentrations per chemical. The concentration series was progressively adjusted so as to approach the 50% mortality. Controls were included in each experiments to give an estimate of control-mortality.	
Source	: Atochem Paris la Defense Atofina Paris La Défense Cedex	
04.12.2001		(33)
Type	: static	
Species	: Daphnia pulex (Crustacea)	
Exposure period	: 48 hour(s)	
Unit	: mg/l	
EC50	: = 4	
EC50, 24h	: = 15	
Analytical monitoring	: no	
Method	: other	
Year	: 1970	
GLP	: no	
Test substance	: no data	
Remark	: Method according to: WERNER, A.E.: Sulphur compounds in kraft pulp mill effluents.Can. Pulp paper Ind., 1963, 16, 3, 35-43.	
Source	: Atochem Paris la Defense EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA) Atofina Paris La Défense Cedex	
Test condition	: The test was made in glass cylinder of 110 ml capacity.The volume of the test solution was 100 ml.The temperature was about 20°C.	
04.12.2001		(29)

4.3 TOXICITY TO AQUATIC PLANTS E.G. ALGAE

Species	: Selenastrum capricornutum (Algae)
Endpoint	: growth rate
Exposure period	: 72 hour(s)
Unit	: mg/l
NOEC	: = 10.43 measured/nominal
EC10	: = 9.3 measured/nominal
EC50	: = 35 measured/nominal
Limit test	:
Analytical monitoring	: yes
Method	: OECD Guide-line 201 "Algae, Growth Inhibition Test"
Year	: 2000
GLP	: yes
Test substance	: other TS: DMDS, Atofina, 99.65% purity
Result	: - Values (mg/l) ErC50, 72h = 35 ErC10, 72h = 9.3 EbC50, 72h = 11 EbC10, 72h = 10.43 NOECb : 10.43 NOECr : 10.43

- control response satisfactory : yes

- BIOLOGICAL OBSERVATIONS

+Cell density at each flask at each measuring point

Sample	Replicat			algal conc. (Cell/ml)
N°	T0	T24h	T48h	T72h
mg/l				
nom				
0	mean	1.00E+04	5.00E+04	2.34E+05 3.28E+06
100	mean	1.00E+04	8.33E+03	2.00E+04 4.23E+04
55.56	mean	1,00E+04	9.00E+03	3.57E+04 2.00E+05
30.86	mean	1.00E+04	1.80E+04	1.08E+05 6.97E+05
17.15	mean	1.00E+04	3.30E+04	2.32E+05 1.68E+06
9.53	mean	1.00E+04	1.60E+04	2.63E+05 1.91E+06
5.29	mean	1.00E+04	4.50E+04	2.87E+07 2.35E+06

+Percent biomass/growth rate inhibition per concentration

sample	mean Inhibition % integral biomass	growth rate
nominal (mg/l)		
	IAI (%)	I _μ i (%)
0	0.00	0.00
5.29	22.03	5.78
9.53	35.27	9.36
17.15	40.10	11.55
30.86	76.32	26.74
55.56	93.70	48.29
100	98.71	75.09

Source

: Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex

Test condition

: - Static test
 · Test temperature range : 24 ± 1 °C
 · Growth/test medium chemistry
 Prepared according to § 1.6.1.2 of C.3. method (Annex 5 of 92/69/EEC Directive)
 pH 8
 · Dilution water source
 See above
 · Exposure vessel type
 120 ml glass bottles completely filled with test solution
 and stoppered with PTFE bungs and sealed with aluminum caps

- Water chemistry in test (pH and O₂ dissolved mg/l)

C% vol	T0	T72h	T0	T72h
0	7.31	7.67	7.7	11.2
5.29	7.03	7.46	7.4	10.0
9.53	7.01	7.46	7.5	11.1
17.15	7.00	7.43	7.8	10.7
30.86	7.00	7.36	7.5	9.6
55.56	7.00	7.27	7.6	9.4
100	7.09	7.18	8.1	8.4

- Stock solutions preparation

Ultrapure water (ultrafiltration, active carbon, ions exchange, 0.22 µm filter)

Stock solution prepared 1 h before the beginning of the test, by adding 94 µl of substance in 1 l of dilution water, stirred during 1h.

- Light levels and quality during exposure

Constantly illuminated between 6000 to 10000 lx.

- Test design

3 replicates at each test concentration

7 concentrations (nominal) :

0, 5.29, 9.53, 17.15, 30.86, 55.56, 100 mg/l

Reliability

: (1) valid without restriction

Flag

: Critical study for SIDS endpoint

31.12.2005

(9)

4.4 TOXICITY TO MICROORGANISMS E.G. BACTERIA

4.5.1 CHRONIC TOXICITY TO FISH

4.5.2 CHRONIC TOXICITY TO AQUATIC INVERTEBRATES

4.6.1 TOXICITY TO SEDIMENT DWELLING ORGANISMS

4.6.2 TOXICITY TO TERRESTRIAL PLANTS

4.6.3 TOXICITY TO SOIL DWELLING ORGANISMS

4.6.4 TOX. TO OTHER NON MAMM. TERR. SPECIES

4.7 BIOLOGICAL EFFECTS MONITORING

4.8 BIOTRANSFORMATION AND KINETICS

4.9 ADDITIONAL REMARKS

5.0 TOXICOKINETICS, METABOLISM AND DISTRIBUTION

5.1.1 ACUTE ORAL TOXICITY

Type	: LD50
Value	: 290 - 500 mg/kg bw
Species	: rat
Strain	: Sprague-Dawley
Sex	: male/female
Number of animals	: 60
Vehicle	: other: polyethylene glycol 300
Doses	: 0, 100, 290, 350, 500 and 5300 mg/kg
Method	: Directive 84/449/EEC, B.1 "Acute toxicity (oral)"
Year	: 1986
GLP	: yes
Test substance	: other TS
Method	: DIMETHYL DISULFIDE was administered undiluted at a volume of 5 ml/kg bw, or as a suspension (10 ml/kg) in polyethylene glycol 300 at the dose levels of 100, 170, 290, 350 and 500 mg/kg. Clinical signs, mortality and body weight gain were checked for a period of up to 14 days following the single administration of the test item. All animals were subjected to necropsy.
Result	: Mortality: - 100 and 170 mg/kg : none - 290 mg/kg : 30 % - 350 mg/kg : none - 500 mg/kg : 100 % Clinical signs: Sedation, hypotonia, dyspnea, piloerection and coma, appeared just after the administration and disappeared after 24 hours. Body weight: No effect was noted on the body weight gain of the surviving rats. Macroscopic examination: Haemorrhagic stomachs was observed at the macroscopic examination of the rats dead on the first day (290 and 500 mg/kg).
Source	: ARKEMA, Paris-la-Défense, France (JFR). Atofina Paris La Défense Cedex
Test condition	: TEST ORGANISMS: - Adaptation period: 7 days - Number of animals: 5 males + 5 females / dose - Controls: no HOUSING The animals were housed 5 of the same sex per polycarbonate cages ADMINISTRATION: - Exposure route: gavage - Volume administered: see freetext ME - Post dose observation period: 14 days

5. Toxicity

Id 624-92-0

Date 31.12.2005

EXAMINATIONS: clinical observations, body weight, mortality and necropsy																																	
Test substance	: Test substance: Dimethyl disulfide CAS no.: 624-92-0 Purity: no data																																
Conclusion	: The oral LD50 of DIMETHYL DISULFURE in rats is lower than 500 mg/kg but higher than 290 mg/kg.																																
Reliability	: (1) valid without restriction																																
Flag	: Material Safety Dataset, Directive 67/548/EEC, Critical study for SIDS endpoint																																
31.12.2005 (30)																																	
Type	: LD50																																
Value	: = 190 mg/kg bw																																
Species	: rat																																
Strain	: Wistar																																
Sex	: male/female																																
Number of animals	: 50																																
Vehicle	: CMC																																
Doses	: 125, 188, 250, 375 and 500 mg/kg																																
Method	: other: EPA 40 CFR 163.81-1																																
Year	:																																
GLP	: yes																																
Test substance	: other TS																																
Method	: DIMETHYL DISULFIDE was administered as a suspension in 3% carboxymethyl cellulose at the dose levels of 125, 188, 250, 375 and 500 mg/kg. Clinical signs, mortality and body weight gain were checked for a period of up to 14 days following the single administration of the test item. All animals were subjected to necropsy.																																
Result	: <table><tr><th rowspan="2">Group</th><th rowspan="2">Dose g/kg</th><th colspan="2">Mortality</th><th rowspan="2">Mortality %</th></tr><tr><th>Male</th><th>Female</th></tr><tr><td>1</td><td>0.125</td><td>0/5</td><td>1/5</td><td>10</td></tr><tr><td>2</td><td>0.188</td><td>5/5</td><td>1/5</td><td>60</td></tr><tr><td>3</td><td>0.250</td><td>3/5</td><td>4/5</td><td>70</td></tr><tr><td>4</td><td>0.375</td><td>5/5</td><td>5/5</td><td>100</td></tr><tr><td>5</td><td>0.50</td><td>5/5</td><td>5/5</td><td>100</td></tr></table>	Group	Dose g/kg	Mortality		Mortality %	Male	Female	1	0.125	0/5	1/5	10	2	0.188	5/5	1/5	60	3	0.250	3/5	4/5	70	4	0.375	5/5	5/5	100	5	0.50	5/5	5/5	100
Group	Dose g/kg			Mortality			Mortality %																										
		Male	Female																														
1	0.125	0/5	1/5	10																													
2	0.188	5/5	1/5	60																													
3	0.250	3/5	4/5	70																													
4	0.375	5/5	5/5	100																													
5	0.50	5/5	5/5	100																													
Source	: LD50 = 0.19 (0.15-0.24) g/kg Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex																																
Test condition	: TEST ORGANISMS: - Adaptation period: 14 days - Number of animals: 5 males + 5 females / dose - Controls: no ADMINISTRATION: - Exposure route: gavage - Volume administered: no data - Post dose observation period: 14 days EXAMINATIONS: clinical observations, body weight, mortality and necropsy STATISTICAL DETERMINATION OF THE LD50: - Litchfield-Wilcoxon method of probit analysis.																																
Test substance	: Test substance: Dimethyl disulfide CAS no.: 624-92-0																																

Conclusion : Purity: no data
Reliability : Acute Oral Defined LD50: 0.19 g/kg
Flag : (1) valid without restriction
 31.12.2005 : Critical study for SIDS endpoint

(26)

5.1.2 ACUTE INHALATION TOXICITY

Type : LC50
Value : = 805 ppm
Species : rat
Strain : Sprague-Dawley
Sex : male/female
Number of animals : 100
Vehicle :
Doses : 0, 500, 700, 775, 800, 840, 875, 950, 1100 and 1581 ppm
Exposure time : 4 hour(s)
Method : other: comparable to OECD Guide-line 403
Year :
GLP : no
Test substance : other TS

Result : MORTALITY:
 See the attached table

CLINICAL SIGNS:
 No data

MACROSCOPIC OBSERVATION:
 No data

Source : LC50 = 805 (776-835) ppm
 : Atofina, Paris-la-Défense, France.
 : Atofina Paris La Défense Cedex
Test condition : Test substance: Dimethyl disulfide
 : C AS no.: 624-92-0
 : Source: Aldrich
 : Batch: no data
 : Purity: no data

Test substance : TEST ORGANISMS:
 - Adaptation period: >= 7 days
 - Number of animals: 5 males + 5 females
 - Controls: no

HOUSING
 The animals of the same sex were housed 5 per cage

ADMINISTRATION:
 - Exposure : whole-body inhalation
 - Analytical control of the concentration: no data

EXAMINATIONS:
 - Clinical observations, mortality and necropsy
 - Post dose observation period: 14 days

STATISTICAL DETERMINATION OF THE LC50:
 - Litchfield-Wilcoxon method of probit analysis.

Attached document : Tansy table.bmp

Dose (ppm)	Mortality
Untreated control	
Blank	0/10
100	0/10
1000	0/10
715	3/10
800	4/10
840	5/10
875	9/10
910	10/10
1,000	10/10
1,500	10/10

Reliability : (2) valid with restrictions
Flag : Critical study for SIDS endpoint
 31.12.2005

(21)

5.1.3 ACUTE DERMAL TOXICITY

Type : LD0
Value : ≥ 2000 mg/kg bw
Species : rabbit
Strain : New Zealand white
Sex : male/female
Number of animals : 10
Vehicle : other: none
Doses : 2000 mg/kg
Method : other: EPA 40 CFR 163.81-2
Year :
GLP : yes
Test substance : other TS

Method : Adaptation period of at least 7 days, five male and five female rabbits.
 A non-permeable patch containing 2 g/kg body weight of the test material (applied neat) was placed over a 4 -5 cm² area on each rabbit.
 After 24 hours exposure to the test material, the patches were removed and the exposed surface was wiped clean of any residual test material using a damp cloth. The rabbits were observed for gross toxicity and mortality at least twice daily for a period of 14 days. Since there were no mortalities, gross necropsies were performed on all survivors at terminal sacrifice. The body weights were recorded on the day of dosing and at 7 and 14 days.

Result : All rabbits appeared active and healthy throughout the test period. There were no overt signs of gross toxicity nor was there any evidence of severe skin lesions. Eight rabbits gained weight over the 14 day observation period and two remained the same.

Gross necropsies were unrevealing. All organs and tissues appeared normal.

Source : Atofina, Paris-la-Défense, France.
 Atofina Paris La Défense Cedex

Test condition : TEST ORGANISMS:
 - Adaptation period: at least 7 days
 - Number of animals: 5 males + 5 females
 - Controls: no

ADMINISTRATION:
 - Exposure route: dermal, under a non-permeable patch, over 10% of the body surface
 - Volume administered: no data

5. Toxicity

Id 624-92-0

Date 31.12.2005

	EXAMINATIONS: - Clinical observations, body weight, mortality and necropsy - Post dose observation period: 14 days
Test substance	: Test substance: Dimethyl disulfide CAS no.: 624-92-0 Source: Pennwalt Corp. Batch: no data Purity: no data
Conclusion	: The acute dermal toxicity of Dimethyl Disulfide is > 2.0 g/kg body weight.
Reliability	: (1) valid without restriction
Flag	: Material Safety Dataset, Directive 67/548/EEC, Critical study for SIDS endpoint
31.12.2005	(25)
Type	: LD0
Value	: >= 2000 mg/kg bw
Species	: rabbit
Strain	: New Zealand white
Sex	: male/female
Number of animals	: 10
Vehicle	: other: none
Doses	: 2000 mg/kg
Method	: other: Directive 79/831/EEC Annexe V
Year	:
GLP	: no
Test substance	:
Result	: No mortality was observed. Apathy and prostration were noted in most of the animals between 15 minutes and 3 hours after the application of the product. An increase in the spontaneous activity was noted for some animals the first day of treatment. The behavior of the animals during the remainder of the period of observation was considered normal. No macroscopic lesion was observed.
Source	: Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex
Test condition	: TEST ORGANISMS: - Acclimatation period: no data - Number of animals: 5 males + 5 females - Controls: no
	ADMINISTRATION: - Exposure route: dermal, under a non-permeable patch, over 10% of the body surface - Volume administered: no data
	EXAMINATIONS: - Clinical observations, body weight, mortality and necropsy - Post dose observation period: 15 days
Test substance	: Test substance: Dimethyl disulfide CAS no.: 624-92-0 Source: SNEA(P) Batch: A1 Purity: no data
Reliability	: (2) valid with restrictions
Flag	: Critical study for SIDS endpoint
31.12.2005	(12)

5.1.4 ACUTE TOXICITY, OTHER ROUTES

5.2.1 SKIN IRRITATION

Species : rabbit
Concentration : undiluted
Exposure : Semiocclusive
Exposure time : 4 hour(s)
Number of animals : 6
Vehicle :
PDII :
Result : slightly irritating
Classification : not irritating
Method : OECD Guide-line 404 "Acute Dermal Irritation/Corrosion"
Year : 1982
GLP : no
Test substance : other TS

Source : Atofina, Paris-la-Défense, France.
 Atofina Paris La Défense Cedex
Test substance : DMDS, purity 98.98%.
Reliability : (2) valid with restrictions
Flag : Material Safety Dataset, Directive 67/548/EEC
 31.12.2005

(15)

Species : rabbit
Concentration : undiluted
Exposure : Occlusive
Exposure time : 24 hour(s)
Number of animals : 6
Vehicle :
PDII : 1.1
Result : slightly irritating
Classification : not irritating
Method : other: EPA 40 CFR 163.81-5
Year :
GLP : yes
Test substance :

Source : Atofina, Paris-la-Défense, France.
 Atofina Paris La Défense Cedex
Test condition : TEST ORGANISMS:
 - Adaptation period: 8 weeks
 - Number of animals: 4 males + 2 females
 - Controls: no

Test substance : Test substance: Dimethyl disulfide
 C AS no.: 624-92-0
 Source: Pennwalt Corp.
 Batch: no data
 Purity: no data

Conclusion : Based on the average Primary Skin Irritation Score at 48 hours (2.02) and the average score over 14 days (1.10), Dimethyl Disulfide is considered to be a mild primary skin irritant.

Reliability : (1) valid without restriction
 31.12.2005

(23)

5.2.2 EYE IRRITATION

Species : rabbit
Concentration : undiluted
Dose : .1 ml
Exposure time : 24 hour(s)
Comment : not rinsed
Number of animals : 6
Vehicle :
Result : irritating
Classification : irritating
Method : OECD Guide-line 405 "Acute Eye Irritation/Corrosion"
Year : 1982
GLP : no
Test substance : other TS

Result : Mean scores (24+48+72 hours) for the 6 rabbits:

- Chemosis: 1.89
 - Enanthema: 1.33
 - Iris: 1.0.
 - Cornea: 0.83

Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex

Test substance : DMDS, purity 98.98%.

Reliability : (2) valid with restrictions

Flag : Material Safety Dataset, Directive 67/548/EEC

31.12.2005

(15)

Species : rabbit
Concentration : undiluted
Dose : .1 ml
Exposure time :
Comment : other: not rinsed for 6 rabbits, rinsed after 20 -30 sec. for 3 rabbits
Number of animals : 9
Vehicle :
Result : slightly irritating
Classification : not irritating
Method : other: EPA-40 CFR 163-81-4
Year :
GLP : yes
Test substance : as prescribed by 1.1 - 1.4

Result : The average 24 hour maximum mean total score (MMTS) for the unwashed eyes was 14.8 (minimally irritating.). For the washed eyes the 24 hour MMTS was 6 (minimally irritating).

Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex

Test condition : TEST ORGANISMS:
 - Adaptation period: 7 days
 - Number of animals: 4 males + 5 females
 - Controls: no

Conclusion : Dimethyl Disulfide is considered to be minimally irritating to both the unwashed and the washed eye.

Reliability : (1) valid without restriction

31.12.2005

(22)

5.3 SENSITIZATION

5. Toxicity

Id 624-92-0

Date 31.12.2005

Type	:	Buehler Test
Species	:	guinea pig
Concentration	:	1 st . Induction undiluted occlusive epicutaneous 2 nd . Challenge undiluted occlusive epicutaneous 3 rd .
Number of animals	:	20
Vehicle	:	
Result	:	not sensitizing
Classification	:	not sensitizing
Method	:	other: EPA-40 CFR 163-81-6
Year	:	1985
GLP	:	yes
Test substance	:	
Result	:	<p>In the preliminary screen, no erythema was observed at any of the concentrations of test material applied to the skin over a 48 hour period. The test material was therefore tested neat in the full scale sensitization study.</p> <p>After the initial and second challenge applications, the guinea pigs did not exhibit any erythema and were considered non-sensitized.</p> <p>Expected responses were noted in the positive control animals. The data validates the responsiveness of the guinea pigs to DNCB.</p>
Source	:	Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex
Test condition	:	TEST ORGANISMS: - guinea pigs - Weight at study initiation: 256-424 g - Adaptation period: 10 days - Number of animals: 10 males for the test substance 10 males for the positive control (DNCB 0.3%) METHOD - Induction: 10 applications every 2 days (excluding week-end) - duration of the application: 6 hours/day - Challenge test: 10 days after the last induction application - Scoring local reaction: 24 and 48 hours after each induction application and after the challenge application
Test substance	:	Test substance: Dimethyl disulfide CAS no.: 624-92-0 Source: Pennwalt Corp. Batch: no data Purity: no data
Conclusion	:	Dimethyl Disulfide is a non (contact) sensitizer.
Reliability	:	(1) valid without restriction
Flag	:	Material Safety Dataset, Directive 67/548/EEC
30.12.2005		

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5.4 REPEATED DOSE TOXICITY

Type	:	
Species	:	rat
Sex	:	male/female
Strain	:	Sprague-Dawley
Route of admin.	:	inhalation

Exposure period : 90 days
Frequency of treatm. : 6 h/day; 5 d/week
Post exposure period : 4 weeks
Doses : 10, 50, 150, 250 ppm
Control group : yes, concurrent vehicle
NOAEL : ca. 10 ppm
LOAEL : = 50 ppm
Method : OECD Guide-line 413 "Subchronic Inhalation Toxicity: 90-day Study"
Year : 1981
GLP : yes
Test substance :

Method : Four groups of 20 male and 20 female Sprague-Dawley were exposed 6 hours/day, 5 days/week to 0, 10, 50, 150, or 250 ppm DMDS. The exposure of the 150 ppm group was terminated after 6 weeks and its treatment-free subgroup necropsied 2 weeks later. The remaining groups received a 13 week exposure period followed by four weeks for the treatment-free subgroups.

Result : MORTALITY
 There was no treatment-related mortality.

CLINICAL SIGNS

The only clinical signs attributable to treatment were salivation, lacrimation or reduced activity during exposure 1 and 2 of the 150 and 250 ppm groups and a low incidence of dyspnoea or wheezing in the early part of the study, particularly in the 250 ppm animals at week 1.

FOB

Functional observation tests indicated no evidence of neurotoxicity.

BOBY WEIGHT

There was a dosage-related decrease in body weight gain over the treatment period in treated groups compared with controls.

FOOD CONSUMPTION

Differences in food consumption paralleled those of body weight gain and werenot statistically significant in the 50 ppm males or the 10 ppm groups.

OPHTHALMOSCOPY

The eyes of the animals were unremarkable.

HAEMATOLOGY

Haematological profiles suggested a possible small reduction in Hb, RBC and PCV in the 250 ppm female group only.

BOOLD CHEMISTRY

Blood chemistry examinations showed treatment-related changes in ALT, alkaline phosphatase and bilirubin.

ORGAN WEIGHTS

There were no changes in organ weights that were considered to be treatment-related.

MACROSCOPIC OBSERVATIONS

There were no treatment-related macroscopic abnormalities at necropsy.

MICROSCOPIC OBSERVATIONS

Source

In the 10, 50 and 250 ppm animals examined microscopically there was a dose-related effect on nasal mucosa.
: Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex

Test condition

: TEST ORGANISMS:

- Number of animals: 100 rats : 20 males + 20 females / dose group (4 dose groups + 1 control group)
- Acclimatation period: 14 days

ADMINISTRATION:

- Type of inhalation study: whole body
- Production of test atmospheres:
Five horizontal flow, recirculating exposure chambers were used.
- Vehicle: filtered air
- Exposure chamber test article concentration
- * Measured concentration
- Samples for analysis were withdrawn from the exposure chambers twice hourly.

SATELLITE GROUPS: none

RECOVERY GROUPS

10 rats/sex/group were allowed to recover for 4 weeks after termination of the main study animals in groups 1, 2, 3 and 5 and for 2 weeks for group 4 animals.

CLINICAL OBSERVATIONS AND FREQUENCY:

- Clinical observations
- * Morbidity and mortality
- * Clinical signs
- * Functional observation tests
- * Body weight
- * Food consumption
- * Ophthalmoscopy

- Laboratory investigations

* Haematology:

Haemoglobin, mean cell volume, red blood cell count and indices: mean cell haemoglobin, mean cell haemoglobin concentration packed cell volume, total and differential white blood cell count platelet count.

* Clinical chemistry:

aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, sodium, potassium, chloride, calcium inorganic phosphorus, glucose, urea, total bilirubin, creatinine, total protein, albumin, albumin/globulin ratio total cholesterol.

- Pathology

* Necropsy

Full internal and external examination at sacrifice

* Organ weights

* Histology

- Statistical evaluation

* ANOVA, T-test

Body weight: week 0

* ANOVA, Regression and Dunnett's

	* ANCOVA, Dunnett's	
	* Kruskal-Wallis, Terpstra-Jonckheere, Wilcoxon	
Test substance	: Test substance: Dimethyl disulfide	
	CAS no.: 624-92-0	
	Source: Atochem	
	Purity: 99.88%	
Conclusion	: Clear treatment-related effects were seen at 50 and 250 ppm and were present to a marginal degree at 10 ppm. It was concluded that the effect level was 50 ppm. The no-effect level was in the region of, but less than, 10 ppm due to the reversible changes in the nasal mucosa	
Reliability	: (1) valid without restriction	
Flag	: Material Safety Dataset, Critical study for SIDS endpoint	
31.12.2005		(11)
Type	:	
Species	: rabbit	
Sex	: male/female	
Strain	: New Zealand white	
Route of admin.	: dermal	
Exposure period	: 28 days	
Frequency of treatm.	: 6 h/day	
Post exposure period	: no	
Doses	: 0.01, 0.1, 1 ml/kg/day (10.63, 106.3 and 1063 mg/kg bw/d)	
Control group	: other: sham treated with the occlusive dressing	
NOAEL	: = 10.63 mg/kg bw	
LOAEL	: = 106.3 mg/kg bw	
Method	: OECD Guide-line 410 "Repeated Dose Dermal Toxicity: 21/28-day Study"	
Year	: 1981	
GLP	: yes	
Test substance	:	
Method	: DMDS was administered daily, by dermal occlusive application (6 hours daily) to four groups of albino rabbits. The dose levels equivalent to 0, 10.63, 106.3, and 1063 mg/kg body weight/day, respectively. The control and 1.0 ml/kg/d group consisting of 10 males and 10 females, and the 0.01 and 0.1 ml/kg/d group consisting of 5 males and 5 females. The animals of the 0.01 and 0.1 ml/kg/d group were treated five days a week during a four-week period, whereas animals of the 1 ml/kg/d group were treated with DMDS for 2 1/2 weeks (i.e. 13 days of treatment).	
Result	: CLINICAL SIGNS: During daily treatment with DMDS, lethargy was observed in a dose related manner in the mid and high dose group. No treatment-related clinical signs were observed in the animals of the low dose group or in the controls. MORTALITY: During the second and third week of the study treatment-related mortality occurred in males and females of high dose group and treatment was suspended after 13 days of treatment. SKIN REACTIONS: Repeated dermal administration of DMDS caused severe, dose-dependent skin irritation in all dose groups. BLOOD EXAMINATIONS: Haematology and clinical chemistry examinations revealed differences in some blood parameters and clinical chemistry in the high dose group males. No treatment related changes were observed in females. PATHOLOGY: The absolute and relative organ weights measured at autopsy did not show statistically significant differences. Macroscopic examination	

Source	<p>at autopsy did not reveal any treatment-related changes other than the dermal lesions induced during the treatment with DMDS.</p> <p>: Atofina, Paris-la-Défense, France.</p> <p>: Atofina Paris La Défense Cedex</p>
Test condition	<p>: TEST ORGANISMS:</p> <ul style="list-style-type: none"> - Number of animals: The control and top-dose group comprised 10 males and 10 females, whereas the low - and mid-dose group comprised 5 males and 5 females. - Acclimatation period: 13 days
	<p>ADMINISTRATION:</p> <ul style="list-style-type: none"> - Route: dermal <p>Doses were applied by volume. The respective amounts of the test substance were applied topically to the intact, shaven skin. The test site was covered with porous gauze dressing fixed onto a non-irritating tape. The entire trunk was wrapped to maintain the gauze dressing in position and to retard evaporation of volatile substances.</p> <p>The animals of the control group were sham-treated with the patches only.</p>
	<p>CLINICAL OBSERVATIONS AND FREQUENCY:</p> <ul style="list-style-type: none"> - Clinical signs: twice a day on exposure days and once a day on non-exposure days. - Mortality: twice a day. - Dermal reactions: <p>At the start of the study and prior to each daily administration.</p> <ul style="list-style-type: none"> - Body weight: - Food consumption: - Blood examinations: <p>haematology and clinical chemistry determinations were conducted in blood or plasma of the animals</p> <p>* Haematology:</p> <p>Hemoglobin, hematocrit, red blood cell count, white blood cell count, differential leukocyte count, platelet count, mean cell volume, mean cell haemoglobin concentration, mean cell haemoglobin</p> <p>* Biochemistry:</p> <ul style="list-style-type: none"> . Electrolytes: calcium, chloride, phosphorous, potassium, sodium, . Enzymes: alkaline phosphatase, alanine -aminotransferase, aspartate-aminotransferase, gamma-glutamyl -transferase . Other: albumin, blood creatinine, blood urea nitrogen, albumin/globulin, glucose, total bilirubin, total cholesterol, total serum protein, bile acids
	<p>ORGANS EXAMINED AT NECROPSY (MACROSCOPIC AND MICROSCOPIC):</p> <ul style="list-style-type: none"> - Weighed organs: adrenals, brain, heart, kidneys, liver, lungs, ovaries, spleen, testes, thyroid and thymus. - Microscopic examinations:
Test substance	<p>: Test substance: Dimethyl disulfide</p> <p>CAS no.: 624-92-0</p> <p>Source: Atochem</p> <p>Purity: 99.88%</p>
Conclusion	<p>: The NOAEL of DMDS for systemic toxicity is 10.63 mg/kg bw/d. For local skin effects, the NOAEL is lower than 10.63 mg/kg bw/d.</p>
Reliability Flag	<p>: (1) valid without restriction</p> <p>: Material Safety Dataset, Critical study for SIDS endpoint</p>

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5. Toxicity

Id 624-92-0

Date 31.12.2005

Type	:	
Species	:	rabbit
Sex	:	male/female
Strain	:	New Zealand white
Route of admin.	:	dermal
Exposure period	:	14 days
Frequency of treatm.	:	6 h/day
Post exposure period	:	no
Doses	:	0.1, 0.5 and 1 ml/kg/day (106, 503 and 1063 mg/kg/day)
Control group	:	other: sham treated with the occlusive dressing
NOAEL	:	< .1 mg/kg
LOAEL	:	= .1 mg/kg
Method	:	other: range finding study
Year	:	
GLP	:	yes
Test substance	:	other TS
Method	:	In this range -finding study, DMDS was administered to a restricted number of albino rabbits by dermal occlusive application, daily, during a two-week period. The dose levels applied were 106.3, 531.5, and 1063 mg DMDS/kg body weight/day, respectively, and the daily exposure period was 6 hours. The control group was sham treated with the occlusive dressing only.
Result	:	During exposure temporary signs slight lethargy in the low-dose group, distinct lethargy in the mid-dose group, and unconsciousness in the high-dose group. At the end of each daily exposure, these effects were no longer observed. During the entire test period of the study, the controls did not show any signs of abnormal behaviour after treatment with the patches only. Repeated dermal administration of DMDS caused severe skin lesions in all three dose groups.
Source	:	Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex
Test substance	:	Test substance: Dimethyl disulfide C AS no.: 624-92-0 Source: Atochem Purity: 99.88%
Reliability	:	(1) valid without restriction
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5.5 GENETIC TOXICITY 'IN VITRO'

Type	:	Salmonella typhimurium reverse mutation assay
System of testing	:	Strains: TA 1535, TA 1537, TA 1538, TA 98, TA 100
Test concentration	:	0, 5, 50, 150, 500, 1500, and 5000 µg/plate
Cycotoxic concentr.	:	>= 5000 µg/plate
Metabolic activation	:	with and without
Result	:	negative
Method	:	OECD Guide-line 471
Year	:	1983
GLP	:	yes
Test substance	:	
Method	:	PRELIMINARY TOXICITY ASSAY The preliminary toxicity assay was used to establish the dose range over which the test article would be assayed. MUTAGENICITY ASSAY

- Five dose levels of test article along with appropriate vehicle control and positive controls were plated with overnight cultures of TA98, TA100, TA1535, TA1537 and TA1538 on selective agar in the presence and absence of Aroclor induced rat liver S9. All dose levels of test article, vehicle control and positive controls were plated in triplicate.

- Second mutation test

The procedure was repeated at a later date.

EVALUATION OF RESULTS

The mean number of revertant colonies for all treatment groups is compared with those obtained for negative and positive control groups. The effect of metabolic activation is assessed by comparing the results obtained both in the presence and absence of the liver microsomal fraction for each treatment group.

A compound is deemed to provide evidence of mutagenic potential if (1) a statistically significant dose-related increase in the number of revertant colonies is obtained in two separate experiments, and (2) the increase in the number of revertant colonies is at least twice the concurrent solvent control value.

Remark

: The positive controls responded as expected.

Source

: Atofina, Paris-la-Défense, France.

Atofina Paris La Défense Cedex

Test condition

: CONTROL MATERIALS

- Negative: culture medium

- Solvent: Dimethylsulphoxide

- Positive:

* With S-9 mix

2-Aminoanthracene at 2 µg/plate for strains TA 1535, TA 1537, TA 1538, TA 98 and TA 100.

* Without S-9 mix

2-Nitrofluorene at 10 µg/plate for strains TA 1538 and TA 98.

9-Aminoacridine at 20 µg/plate for strain TA 1537. Sodium azide at 5 µg/plate for strains TA 1535 and TA 100.

ACTIVATION

- S9 derived from Sprague-Dawley rats induced with a single intraperitoneal injection of Aroclor 1254, 500 mg/kg, five days prior to sacrifice.

- S9 mix composition:

Component	Concentration
S9	10% (v/v)
Sodium phosphate buffer (pH 7.4)	100 mM
glucose 6-phosphate	5 mM
NADP	4 mM
KCl	33 mM
MgCl ₂	8 mM

TEST ORGANISMS

- Salmonella typhimurium strains: TA98, TA100, TA1535, TA1537 and a 1538

- test organisms were properly maintained and were checked for appropriate genetic markers (rfa mutation, R factor)

TEST CONCENTRATIONS

(a) Preliminary cytotoxicity assay:

Plate incorporation assay: 0, 5, 50, 500 and 5000 µg per

	plate were evaluated with and without S9 activation in all strains. A single plate was used, per dose, per condition.	
	(b)Mutation assays: Plate incorporation assay: 50, 150, 500, 1500 and 5000 µg per plate were evaluated in triplicate in the presence and absence of S9 activation; all test strains were used.	
Test substance	: Test substance: Dimethyl disulfide CAS no.: 624-92-0 Purity 98.98%	
Reliability	: (1) valid without restriction	
Flag 30.12.2005	: Material Safety Dataset, Critical study for SIDS endpoint	(1)
Type	: Salmonella typhimurium reverse mutation assay	
System of testing	: Strains: TA 1535, TA 1537, TA 1538, TA 98, TA 100	
Test concentration	: 50, 166, 500, 1666, 5000 µg/plate	
Cycotoxic concentr.	: 5000 µg/plate	
Metabolic activation	: with and without	
Result	: negative	
Method	: OECD Guide-line 471	
Year	: 1983	
GLP	: yes	
Test substance	:	
Method	: PRELIMINARY TOXICITY ASSAY The preliminary toxicity assay was used to establish the dose range over which the test article would be assayed.	
	MUTAGENICITY ASSAY - Five dose levels of test article along with appropriate vehicle control and positive controls were plated with overnight cultures of TA98, TA100, TA1535, TA1537 and TA1538 on selective agar in the presence and absence of Aroclor induced rat liver S9. All dose levels of test article, vehicle control and positive controls were plated in triplicate. - Second mutation test The procedure was repeated at a later date.	
	TEST PROCEDURE - Without metabolic activation 0.1 ml aliquots of bacterial suspension is added to each of one set of sterile tubes. 0.1 ml of the test compound is added to cultures at five concentrations. The negative control is the chosen solvent. The appropriate positive control is also included. - With metabolic activation Methodology is as described above except that 0.5 ml of liver homogenate S-9 mix is added to the tubes in place of sterile buffer.	
	EVALUATION OF RESULTS The mean number of revertant colonies for all treatment groups is compared with those obtained for negative and positive control groups. The effect of metabolic activation is assessed by comparing the results obtained both in the presence and absence of the liver microsomal fraction for each treatment group. A compound is deemed to provide evidence of mutagenic potential if (1) a statistically significant dose-related increase in the number of revertant colonies is obtained in	

two separate experiments, and (2) the increase in the number of revertant colonies is at least twice the concurrent solvent control value.

Source : Atofina, Paris-la-Défense, France.
Atofina Paris La Défense Cedex

Test condition : CONTROL MATERIALS
- Negative: culture medium
- Solvent: Dimethylsulphoxide
- Positive:
* With S-9 mix
2-Aminoanthracene at 5 µg/plate for strains TA 1535, TA 1537, TA 1538, TA 98 and TA 100.
* Without S-9 mix
2-Nitrofluorene at 5 µg/plate for strains TA 1538 and Ta98
9-Aminoacridine at 150 µg/plate for strain TA 1537.
Sodium azide at 10 µg/plate for strains TA 1535 and TA 100.

ACTIVATION

- S9 derived from Sprague-Dawley rats induced with a single intraperitoneal injection of Aroclor 1254, 500 mg/kg, five days prior to sacrifice.

- S9 mix composition:

Component	volume
S9	100 µl
Sodium phosphate buffer 0.2M (pH 7.4)	500 µl
glucose 6 -phosphate	5 µl
NADP 0.1 M	40 µl
KCl 1.65 M	20 µl
MgCl2 0.4	20 µl

TEST ORGANISMS

- Salmonella typhimurium strains: TA98, TA100, TA1535, TA1537 and a 1538

- test organisms were properly maintained and were checked for appropriate genetic markers (rfa mutation, R factor)

TEST CONCENTRATIONS

(a) Preliminary cytotoxicity assay:

Plate incorporation assay: 0, 50, 144, 500, 1444 and 5000 µg per plate were evaluated without S9 activation with strains TA100 and TA 1538. Two plate was used, per dose, per condition.

(b) Mutation assays:

Plate incorporation assay: 0, 50, 166, 500, 1666 and 5000 µg per plate were evaluated in triplicate in the presence and absence of S9 activation; all test strains were used.

Test substance : Test substance: Dimethyl disulfide
C AS no.: 624-92-0

Purity: no data

Conclusion : Dimethyldisulfide was negative in the Ames/Salmonella tester strains TA1535, TA1537, TA1538, TA98 and TA100 with and without metabolic activation preparation over the dose range 50-5000 µg/plate.

Reliability : (1) valid without restriction

Flag : Critical study for SIDS endpoint

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Type : Chromosomal aberration test

System of testing : Human Lymphocytes

Test concentration : 3.7; 11.1; 33.3; 100; 300 µg/ml

Cycotoxic concentr. : >= 300 µg/ml

Metabolic activation	:	with and without
Result	:	ambiguous
Method	:	OECD Guide-line 473
Year	:	1983
GLP	:	yes
Test substance	:	
Method	:	<p>- Preliminary Cytotoxicity Assay: The dose levels used in the chromosome aberration assay were established on the basis of the results of a preliminary toxicity test carried out with 6 concentrations of the test substance (ranging from 0.5 to 1000.0 µg/ml), both in the absence and in the presence of the metabolic activation system (S-9 mix). The highest concentration for the toxicity test was determined by the limit of the solubility of the test substance in the tissue culture medium.</p> <p>- Cytogenetic Assay: * Cell Treatment After 48 h of incubation, the cultures were centrifuged. The cell pellets were resuspended in tissue culture medium supplemented with 20 mM HEPES (and 10% S-9 mix, for the test with metabolic activation) and appropriate test solutions. An untreated culture and a culture receiving DMSO served as negative controls. For each concentration of the test substance and for the controls one culture was used. Without S9, the cultures were incubated in closed tubes for another 24 hours including a 2 hour colcemid treatment. With S-9 mix, the exposure of the cells to the test substance was reduced to only 2 hours, because of the toxicity of the S-9 mix for the cells. After the 2 hour incubation period, the cells washed and supplied with freshly prepared culture medium. The cells were incubated for a further 22 hours (including a 2 hour colcemid treatment.</p> <p>* Cell harvesting: Two hours before the end of the total incubation period the cells were arrested in the metaphase stage of the mitosis by the addition of colcemid. The cells were harvested, treated with a hypotonic solution, fixed three hours, and transferred to clean microscope slides. Two slides were prepared from each culture. The slides were stained 1000 stimulated lymphocytes were examined (500 from each slide) to determine the mitotic index (percentage of cells in mitosis).</p> <p>* Metaphase analysis: From each culture, 100 well-spread metaphases (each containing 46 chromosomes) were analysed by microscopic examination for a wide range of structural chromosome aberrations (gaps, breaks, fragments, dicentrics, exchanges etc.) and other anomalies (endoreduplication, polyploidy), according to the criteria recommended by Savage (1975).</p> <p>- Evaluation criteria: The major criterion to designate the results of a chromosome aberration test as positive is a dose-related, statistically significant increase in the number of cells with structural chromosome aberrations. However, a clear dose-response relationship can be absent because the yield of chromosome aberrations can vary markedly with post-treatment sampling time of an asynchronous population and because increasing doses of clastogens can induce increasing degrees of mitotic delay. A test substance producing neither a dose-related,</p>

	statistically significant increase in the number of cells with structural chromosome aberrations, nor a statistically significant and reproducible positive response at any of the doses is considered non-clastogenic in this system.												
Result	: The test substance did not induce a statistically significant increase in the number of cells with structural chromosome aberrations at non toxic concentrations, both in the absence and in the presence of the S-9 mix. At the very toxic concentration of 300.0 µg/ml, both in the absence and in the presence of the S-9 mix, the test substance induced a statistically significant increase in the number of cells with structural chromosome aberrations.												
	The positive control substances, mitomycin C and cyclophosphamide, induced the expected increase in the incidence of structural chromosome aberrations.												
Source	: Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex												
Test condition	: Control Materials: Negative: DMSO Solvent: The test article (dissolved in DMSO) was soluble in culture medium at a maximum concentration of 1 mg/mL Positive: -S9: mitomycin C (MMC) 0.05 µg/mL +S9: cyclophosphamide (CP) 25 µg/mL												
	Activation: S9 derived from adult male Wistar rats (Aroclor 1254 induced rat liver). The composition of the rat liver S9 reaction mix was: 8 mM magnesium chloride, 33 mM potassium chloride, 5 mM glucose-6-phosphate, 4 mM nicotinamide adenine dinucleotide phosphate (NADP), 100 mM sodium phosphate and 40% S9.												
	Culture Medium: RPMI 1640 medium supplemented with heat-inactivated foetal calf serum, 100 units penicillin/mL, 100 µg streptomycin/mL, 2 mM L-glutamine and 25 µl phytohaemagglutinin/ml												
	Test compound concentrations used: <table><tr><td>Treatment condition</td><td>Treatment time</td><td>Recovery time</td><td>Dose levels (µg/mL)</td></tr><tr><td>-S9</td><td>24hr</td><td>24 hr</td><td>3.7, 11.1, 33.3, 100, 300</td></tr><tr><td>+S9</td><td>2 hr</td><td>24 hr</td><td>3.7, 11.1, 33.3, 100, 300</td></tr></table>	Treatment condition	Treatment time	Recovery time	Dose levels (µg/mL)	-S9	24hr	24 hr	3.7, 11.1, 33.3, 100, 300	+S9	2 hr	24 hr	3.7, 11.1, 33.3, 100, 300
Treatment condition	Treatment time	Recovery time	Dose levels (µg/mL)										
-S9	24hr	24 hr	3.7, 11.1, 33.3, 100, 300										
+S9	2 hr	24 hr	3.7, 11.1, 33.3, 100, 300										
Test substance	: Test substance: Dimethyl disulfide CAS no.: 624-92-0 Source: Atochem Purity: 99.98%												
Reliability Flag	: (1) valid without restriction												
31.12.2005	: Material Safety Dataset, Critical study for SIDS endpoint												
Type	: Mammalian cell gene mutation assay												
System of testing	: HGPRT assay on CHO cells												
Test concentration	: 0.46; 1.37; 4.12; 12.3; 37.0; 74.0; 111; 333; 667 and 1000 µg/ml												
Cycotoxic concentr.	: 74.0-1000 µg/ml												
Metabolic activation	: with and without												
Result	: negative												
Method	: OECD Guide-line 476												
Year	: 1984												
GLP	: yes												
Test substance	:												

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Method	<p>: The dose levels used in the HGPRT assay were established on the basis of the results of a preliminary solubility test. A final concentration of 1,000 µg/ml was chosen as highest concentration for the HGPRT assays.</p> <p>The two independent HGPRT-assays were carried out with single cultures for each concentration of the test substance and for the negative and positive controls.</p>
Result	<p>: In the absence of the S -9 mix, the test substance induced neither a concentration-related increase in the mutant frequency nor a reproducible positive response at one of the test concentrations. In the presence of a metabolic activation system, DMS induced a slight increase in mutant frequency at several concentrations, in both HGPRT assays. These increases were neither concentration-related nor clearly reproducible. In both HGPRT assays, the test substance appeared to be highly toxic to CHO cells at a concentration range from 74.0-1,000 µg/ml.</p> <p>The positive control substances, ethylmethanesulfonate and dimethylnitrosamine, induced the expected increase in the mutant frequency.</p>
Source	<p>: Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex</p>
Test condition	<p>: - Control Materials: * Negative: DMSO * Solvent: The test article (dissolved in DMSO) was soluble in culture medium at a maximum concentration of 1 mg/mL * Positive: -S9: Ethylmethanesulfonate 0.2 mL/L +S9: Dimethylnitrosamine 2 or 4 mL/L</p> <p>- Activation: S9 derived from adult male Wistar rats</p> <p>- Culture Medium: Ham's F-12 medium supplemented with 10% heat-inactivated foetal calf serum, 50 µg gentamicin/mL and 2 mM L-glutamine.</p> <p>- Evaluation of the results: The following criteria were used to evaluate the data obtained in the HGPRT assay (Li et al. 1987) a) the survival (absolute cloning efficiency) of the negative controls should not be less than 50%, b) the mean mutant frequency of the negative controls should fall within the range of 0-20 6-TG resistant mutants per 10e6 clonable cells, c) the positive controls must induce a response of a magnitude appropriate for the mutagen under the experimental conditions applied, d) the highest test substance concentration should, if possible, result in a clear cytotoxic response (e.g. 10-30% of the relative initial survival). Any apparent increase in mutant frequency at concentrations of the test substance causing more than 90% toxicity is considered to be an artifact and not indicative of genotoxicity.</p> <p>Genotoxicity of the test substance was evaluated using the following criteria (Li et al. 1987): a) a concentration-related increase in mutant frequency, b) a reproducible positive response for at least one of the test substance concentrations (e.g. the mean mutant</p>

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	frequency should be more than 20 mutants per 10e6 clonable cells).	
Test substance	: Test substance: Dimethyl disulfide C AS no.: 624-92-0 Source: Atochem Purity: 99.88%	
Conclusion	: No evidence for a genotoxic effect of DMDS was found in cultured CHO cells, under the conditions used in the HGPRT assay.	
Reliability	: (1) valid without restriction	
Flag 31.12.2005	: Material Safety Dataset, Critical study for SIDS endpoint	(13)
Type	: DNA damage and repair assay	
System of testing	: Rat hepatocytes in primary culture	
Test concentration	: 1; 5; 10; 50; 100; 200 and 300 µg/ml	
Cycotoxic concentr.	: >= 100 µg/ml	
Metabolic activation	: without	
Result	: negative	
Method	: OECD Guide-line 482	
Year	: 1986	
GLP	: yes	
Test substance	: other TS	
Method	: - Cytotoxicity evaluation: The test compound cytotoxicity was assessed for both DNA repair studies at the end of the treatment: Each concentration of Dimethyldisulfide was tested in triplicate. - Autoradiography: Autoradiographs were prepared by dipping slides in a photographic emulsion then developed. Slides were stained in hematoxylin-phloxin. - Slide assessment: For each cell, following nuclear grain court, cytoplasmic count was performed on 3 areas of the same size as the nucleus and adjacent to it. - Data interpretation The test compound is considered positive when the mean nuclear grain court is statistically greater than that of the control, the mean net nuclear grain court is above 3 grains per nucleus, and the percentage of treated cells in repair is significantly different from that of the controls. In addition, the effect must be shown to be reproducible between experiments.	
Result	: Results - Cytotoxic at 100, 200 and 300 µg/ml IC50 evaluated by LDH release: 98 µg/ml (2nd study) - not genotoxic at concentrations of 10, 50, 100 and 200 µg/ml	
Source	: The positive controls responded as expected. Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex	
Test condition	: - Control Materials: * Negative: pyrene 1 µM * Solvent: DMSO The test article was soluble in culture medium at a maximum	

	concentration of 100 µg/mL
	* Positive:
	. 7,12-DMBA (10 µM)
	. 2-aminofluorene (0.1 and 0.5 µM)
Test substance	: - Number of cultures/concentration/study: 3 : Test substance: Dimethyl disulfide : C AS no.: 624-92-0 : Source: Atochem : Purity: 99.88%
Conclusion	: Not genotoxic in vitro in the DNA repair test.
Reliability	: (1) valid without restriction
Flag	: Material Safety Dataset, Critical study for SIDS endpoint
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5.6 GENETIC TOXICITY 'IN VIVO'

Type	: Micronucleus assay
Species	: mouse
Sex	: male/female
Strain	: Swiss
Route of admin.	: inhalation
Exposure period	: 6 h/day for 4 days
Doses	: 0 , 250 and 500 ppm
Result	: negative
Method	: OECD Guide-line 474 "Genetic Toxicology: Micronucleus Test"
Year	: 1983
GLP	: yes
Test substance	: other TS
Method	: Three groups of mice were exposed during 6 hours a day for 4 consecutive days (days 0 through 3) to atmospheres containing 0 ppm (5/sex), 250 ppm (5/sex) and 500 ppm DMDS (10/sex). The positive control group (5/sex) was treated once intraperitoneally, 24 hours before sacrifice, with 1.5 mg Mitomycin C per kg body weight.
Result	: Bone marrow cells were collected from the femur and processed into smears for microscopic examination. One smear from each animal was examined for the presence of micronucleated poly- and normochromatic erythrocytes, (abbreviated MPE and MNE, respectively), and the total numbers of poly- and normochromatic erythrocytes (PE and NE) in a total of at least 2000 erythrocytes (E) in such a way that a minimum of 1000 PE was observed. : Exposure to DMDS resulted in clear signs of intoxication both at the 250 ppm and the 500 ppm level. Mortality was observed in some animals at 500 ppm group. Exposure to 250 ppm and 500 ppm DMDS resulted in body weight loss both in males and females. There were no indications for increases in the incidences of MPE, MNE or ME attributable to treatment with the test material. Mean numbers of PE per 1000 E were slightly lower in mice exposed to 500 ppm DMDS, both in males and females (0.001<P<0.01) pointing to slight cytotoxic effects on bone marrow cells.

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	Animals treated with the mutagen Mitomycin C showed an increased incidence of MPE.
Source	: Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex
Test condition	: * CONTROL MATERIALS - Positive :
Test substance	: Mitomycin C, single ip administration, 1.5 mg/kg Test substance: D imethyl disulfide CAS no.: 624-92-0 Source: Atochem Purity: 99.88%
Conclusion	: It was concluded that the results of the micronucleus test did not provide any indication of chromosomal damage and/or damage to the mitotic apparatus in bone marrow cells of mice exposed to DMDS.
Reliability	: (1) valid without restriction
Flag	: Material Safety Dataset, Critical study for SIDS endpoint
31.12.2005	(5)
Type	: Unscheduled DNA synthesis
Species	: rat
Sex	: male
Strain	: Wistar
Route of admin.	: inhalation
Exposure period	: 4 hours
Doses	: 0 and 500 ppm
Result	: negative
Method	: other: OECD Guide-line 482
Year	: 1986
GLP	: yes
Test substance	: other TS
Method	: Dimethyldisulfide (DMDS) was examined for its potential to induce unscheduled DNA synthesis (UDS) in primary rat hepatocytes after short-term exposure of male wistar rats to the test substance by inhalation. For the genotoxicity assay male rats were exposed by inhalation for a period of 4 h to one high concentration of 500 ppm DMDS (maximally tolerated concentration). Immediately after exposure and after subsequent non-exposure periods of 16 and 24 h, animals were sacrificed for isolation of hepatocytes. The DNA-repair activities were examined by autoradiography in monolayer cultures of hepatocytes, incubated in the presence of [methyl-3H]thymidine. The hepatocarcinogen 2-acetylaminofluorene (2 AAF), was used as a positive control in the in vivo/in vitro DNA repair assay and in the in vitro DNA-repair assay (2 AAF). Hepatocytes isolated from animals exposed to air only served as negative controls.
Result	: DMDS did not induce DNA-repair activities in hepatocytes, either during the 4 h exposure period or during the subsequent 16 h or 24 h after the exposure period.
Source	: The positive control substance, 2-AAF, induced the expected increase in DNA-repair activities. Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex
Test condition	: * CONTROL MATERIALS - Positive : . in vivo: 2-AAF, 50 mg/kg single oral administration . in vitro: 2-AAF, 10e-4M

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Test substance : Test substance: Dimethyl disulfide
C AS no.: 624-92-0
Source: Atochem
Purity: 99.88%

Conclusion : It was concluded that DMDS did not induce DNA-repair in rat hepatocytes.

Reliability : (1) valid without restriction

Flag : Material Safety Dataset, Critical study for SIDS endpoint

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5.7 CARCINOGENICITY

5.8.1 TOXICITY TO FERTILITY

5.8.2 DEVELOPMENTAL TOXICITY/TERATOGENICITY

Species : rat
Sex : female
Strain : other: Crl: CD(SD)BR
Route of admin. : inhalation
Exposure period : day 6 to day 15 of gestation
Frequency of treatm. : 6 h/day
Duration of test : up to gestation day 20
Doses : 5; 15; 50 ppm
Control group : yes, concurrent no treatment
NOAEL maternal tox. : = 5 ppm
NOAEL teratogen. : = 50 ppm
NOAEL Fetotoxicity : = 15 ppm
Method : OECD Guide-line 414 "Teratogenicity"
Year : 1981
GLP : yes
Test substance :

Method : Three groups of 30 mated female rats were exposed to DMDS by whole body exposure at 5, 15 or 50 ppm for 6 hours daily from day 6 to day 15 of gestation. A similar group of 30 rats, exposed to filtered air only over the same period, served as controls. All animals were maintained until day 20 of gestation, killed and their uterine content assessed.

Result : The chamber concentrations of the test article were close to target values throughout the exposure period. There were no deaths. A higher incidence of rough haircoat was observed at 50 ppm. Clinical condition at 5 and 15 ppm did not differ from controls. Dosage-related reductions in weight gain were observed at 15 and 50 ppm. Food intake was lower than controls at 50 ppm but comparable at 5 or 15 ppm.

No unusual lesions were observed at necropsy. There was no effect of treatment on pre or post-implantation loss, litter size or sex ratio. Litter and foetal weights were reduced at 50 ppm. At 5 and 15 ppm these parameters were comparable to controls. No malformations were observed in foetuses from the treated groups. A slightly higher incidence of retarded ossification was observed at 50 ppm but was considered to indicate delayed maturation, as a result of the lower foetal weight, rather than a teratogenic

	effect.
Source	: Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex
Test condition	: TEST ORGANISMS: - Number of animals: 100 rats : 25 females / dose group (3 dose groups + 1 control group) - Acclimatation period: no data ADMINISTRATION: - Type of inhalation study: whole body - Vehicle: filtered air - Exposure chamber test article concentration * Measured concentration Samples for analysis were withdrawn from the exposure chambers twice hourly. EXPERIMENTAL OBSERVATION - Morbidity and mortality All females were examined twice daily to detect any which were dead or moribund. - Clinical observations All females were examined daily from day 3 to day 20 of gestation. Any abnormalities of appearance or behaviour or other signs of reaction to treatment or ill health were recorded. - Body weight The body weight of each female was recorded - Food intake The amount of food consumed by each cage of females was recorded daily from day 3 to day 20 of gestation and reported on the body weight intervals. - Terminal studies * Necropsy All females were killed on day 20 of gestation, in random group order and examined macroscopically. * Uterine/implantation data pregnancy status number of corpora lutea number and intrauterine position of implantations subdivided into: live foetuses early intrauterine deaths late intrauterine deaths dead foetuses - Foetal data Foetuses were weighed individually, examined externally and sexed. The viscera of approximately one half of the foetuses in each litter were examined. The skeleton was examined and preserved and stored in absolute glycerol (containing thymol crystals). The remaining foetuses were placed in Bouin's fluid for at least two weeks then transferred to 70% industrial methylated spirit. Foetal abnormalities were recorded as malformations (rare and/or potentially lethal defects) and variations (commonly occurring non-lethal abnormalities). Test substance
	: Test substance: Dimethyl disulfide CAS no.: 624-92-0 Source: Atochem Purity: 99.88%
Conclusion	: Exposure to DMDS at 50 ppm elicited maternal toxicity, with

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	associated fetal growth retardation (demonstrated by low weight and retarded ossification). There was no indication of a teratogenic effect. At 15 ppm, less marked maternal toxicity was observed and there were no fetal effects. There was no adverse effect of treatment, maternal or fetal, at 5 ppm.	
Reliability	: (1) valid without restriction	
Flag	: Material Safety Dataset, Critical study for SIDS endpoint	
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Species	: rat	
Sex	: female	
Strain	: other: Crl: CD(SD)BR	
Route of admin.	: inhalation	
Exposure period	: day 6 to day 15 of gestation	
Frequency of treatm.	: 6 h/day	
Duration of test	: up to gestation day 20	
Doses	: 10, 50 and 250 ppm	
Control group	: yes, concurrent no treatment	
NOAEL maternal tox.	: < 10 ppm	
Method	: other: range-finding study	
Year	:	
GLP	: yes	
Test substance	: other TS	
Method	: Three groups of 7 time-mated female rats were exposed by inhalation (whole body) to concentrations of 10, 50 or 250 ppm of DMDS daily from day 6 to day 15 of gestation. A similar group of animals exposed to filtered air by the same route and over the same period acted as controls. All animals were maintained to day 20 of gestation when they were killed and their uterine contents assessed.	
Result	: All animals survived to day 20 of gestation. Common clinical signs were observed at an incidence which increased with dose, in the treated groups only. Dosage-related reductions in body weight gain were apparent in all treated groups over the exposure period. Dosage-related reductions in food intake were apparent in all treated groups over the exposure period. In the intermediate and high dose groups the lower intake persisted until termination. Pregnancy incidence was within the expected range in all groups. Pre-implantation loss was within the expected range in all treated groups. There was no adverse effect of treatment on the incidence of intrauterine deaths. Litter size was within the expected range in all treated groups. Sex ratio was within the expected range in all groups. Mean litter weight was higher than controls in all treated groups. Mean foetal weight showed a dosage-related reduction in the treated groups, but was considered an equivocal result as values for the control and low dose groups exceeded normal limits. No malformations were observed at external examination of foetuses and the incidence of variations did not indicate an adverse effect of treatment.	
Source	: Atofina, Paris-la-Défense, France. Atofina Paris La Défense Cedex	
Test substance	: Test substance: Dimethyl disulfide CAS no.: 624-92-0 Source: Atochem Purity: 99.88%	
Reliability	: (1) valid without restriction	

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5.8.3 TOXICITY TO REPRODUCTION, OTHER STUDIES

5.9 SPECIFIC INVESTIGATIONS

5.10 EXPOSURE EXPERIENCE

5.11 ADDITIONAL REMARKS

6.1 ANALYTICAL METHODS

6.2 DETECTION AND IDENTIFICATION

7.1 FUNCTION

7.2 EFFECTS ON ORGANISMS TO BE CONTROLLED

7.3 ORGANISMS TO BE PROTECTED

7.4 USER

7.5 RESISTANCE

8.1 METHODS HANDLING AND STORING

8.2 FIRE GUIDANCE

8.3 EMERGENCY MEASURES

8.4 POSSIB. OF RENDERING SUBST. HARMLESS

8.5 WASTE MANAGEMENT

8.6 SIDE-EFFECTS DETECTION

8.7 SUBSTANCE REGISTERED AS DANGEROUS FOR GROUND WATER

8.8 REACTIVITY TOWARDS CONTAINER MATERIAL

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- (1) ATOCHEM. Ames metabolic activation test to assess the potential mutagenic effect of dimethyl disulphide. HRC report no. ATO 10/85427, 15 May 1985.
 - (2) ATOCHEM. An in vivo/in vitro rat hepatocyte DNA-repair assay with dimethyldisulfide (DMDS). TNO-CIVO, Report V 90.082, May 1990.
 - (3) ATOCHEM. Dimethyl Disulfide (DMDS), Inhalation Teratology Study in the Rat, Hazleton UK, Report 6205-514/9, December 1991.
 - (4) ATOCHEM. DIMETHYL DISULFIDE (DMDS): Inhalation range-finding study in the pregnant rat. Hazleton-UK study no. 6142-514/8, May 1991.
 - (5) ATOCHEM. Examination of dimethyl disulfide in the micronucleus test, TNO-CIVO, Report V 89.366, October 1989.
 - (6) ATOCHEM. Repeated-dose (28-day) dermal toxicity study with Dimethyl Disulfide (DMDS) in rabbits, TNO-CIVO Institutes, Report V 89.371/280554, February 1989.
 - (7) BENTVELZEN, J.M. et al, 1975. Tappi, 58, 102-5. Kinetics of methyl mercaptan oxidation and dimethyl disulfide hydrolysis in alkaline solutions.
 - (8) ELF ATOCHEM S.A., 1995. DIMETHYL DISULFURE. Détermination de la biodégradabilité facile. Essai en fioles fermées. Ref 95/SAEK/0415/NM.
 - (9) Elf Atochem S.A., 2000. Centre d'application de Levallois. DISULFURE DE DIMETHYLE. Inhibition de la croissance des algues. Etude N° 504/99/A.
 - (10) ELF ATOCHEM SA, 1996. DISULFURE DE DIMETHYLE. Toxicité aiguë vis-à-vis des daphnies. Rapport N°2606/95/A.
 - (11) ELF ATOCHEM, DMDS: 90 day inhalation toxicity study in the rat with a 4 week recovery period, Hazleton UK, Report 6491-514/7, January 1992.
 - (12) ELF ATOCHEM, Détermination de la toxicité par voie percutanée chez le lapin, Hazleton - IFT, Report 505207, 2 May 1985.
 - (13) ELF ATOCHEM, In Vitro assay for the induction of point mutations in the HGPRT locus of Chinese hamster ovary cells by dimethyldisulfide (DMDS), TNO-CIVO Institute, Report V 89.257, May 1990.
 - (14) ELF ATOCHEM. Chromosome analysis of cultured human lymphocytes following in vitro treatment with DMDS. TNO-CIVO Institute, Report V 89.045, March 1990.
 - (15) ELF ATOCHEM. DISULFURE DE DIMETHYLE. Tests de tolérance locale chez le lapin. Hazleton-IFT, Report 503398, 21 March 1985.

- (16) ELF ATOCHEM. In Vitro DNA Repair Test on Rat Hepatocytes in Primary Culture, SANOFI, Report RA860891026/PN1, 22 february 1990.
- (17) ELF ATOCHEM. Repeated-dose (14 -day) dermal toxicity range-finding study with Dimethyl Disulfide (DMDS) in rabbits. TNO-CIVO Institutes, Report V 89.058/280553, July 1989.
- (18) Epiwin v 3.12, syspro experimental database
- (19) EPIWIN v3.12
- (20) Hansch,C et al. (1995)
- (21) M.F. Tansy et al., Acute and Subchronic Toxicity studies of Rats Exposed to Vapors of Methyl Mercaptan and Other Reduced-Sulfur Compounds, J. Toxic. Environm. Health 1981, 8, 71-88.
- (22) Pennwalt Corp. DIMETHYL DISULFIDE, EPA primary eye irritation. Products Safety Labs, Report T-5148, 24 June 1985.
- (23) Pennwalt Corp. DIMETHYL DISULFIDE, EPA primary skin irritation. Products Safety Labs, Report T-5149, June 24 1985.
- (24) Pennwalt Corp. DIMETHYL DISULFIDE, Guinea pig sensitization (Buehler). Products Safety Labs, Report T-5151, 30 August 1985.
- (25) Pennwalt Corp., DIMETHYL DISULFIDE. EPA acute dermal toxicity limit test. Products Safety Labs, Report T-5150, 24 June 1985.
- (26) Pennwalt Corp., DIMETHYL DISULFIDE. EPA acute LD50. Products Safety Labs, Report T-5147A, 14 August 1985.
- (27) Pennwalt Corporation. DIMETHYL DISULFIDE, Ames Salmonella/Microsome Plate Test (EPA/OECD). Pharmakon Research International, Inc. Report PH 301-PW-003-85, 31 May 1985.
- (28) Safety Data Sheet Elf Atochem January 1988
- (29) SEPPOVAARA, O. and HYNNINEN, P., 1970.On the toxicity of sulfate -mill condensates.Papper och Trä, 1, 11-23.
- (30) SNEAP, Dimethyl disulfure (DMDS) - Evaluation de la toxicité aigüe chez le rat par voie orale, CIT Report 2064 TAR, June 1986.
- (31) Syracuse Research Corporation (SRC) and EPIWIN v 3.12.
- (32) Technical Data Sheet A-1130-401 Elf Atochem January 1993
- (33) WERNER, A.E.: Sulphur compounds in kraft pulp mill effluents.Can. Pulp paper Ind., 1963, 16, 3, 35-43.

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10.1 END POINT SUMMARY

10.2 HAZARD SUMMARY

10.3 RISK ASSESSMENT